INT Workshop on "QCD Critical Point"

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July 28 - Aug. 22, 2008

http://int.phys.washington.edu/PROGRAMS/08-2b.html

Report on the First Week

Nu Xu

Program

Monday, July 28, 2008
10:30 am - Sourendu Gupta, Tata Institute
Seminar on: **"New results in QCD at finite chemical potential"**

Tuesday, July 29, 2008
9:30 am - Maria Paola Lombardo, INFN
Seminar on: "The QCD critical point at imaginary mu"

11:00 am - Shinji Ejiri, BNL
Seminar on: **"Numerical study of the critical point in lattice QCD at high temperature and density"**

Wednesday, July 30, 2008
9:30 am - Kenji Fukushima, Yukawa Institute for Theoretical Physics
Seminar on: "What can we learn from the model studies on the QCD critical point?"

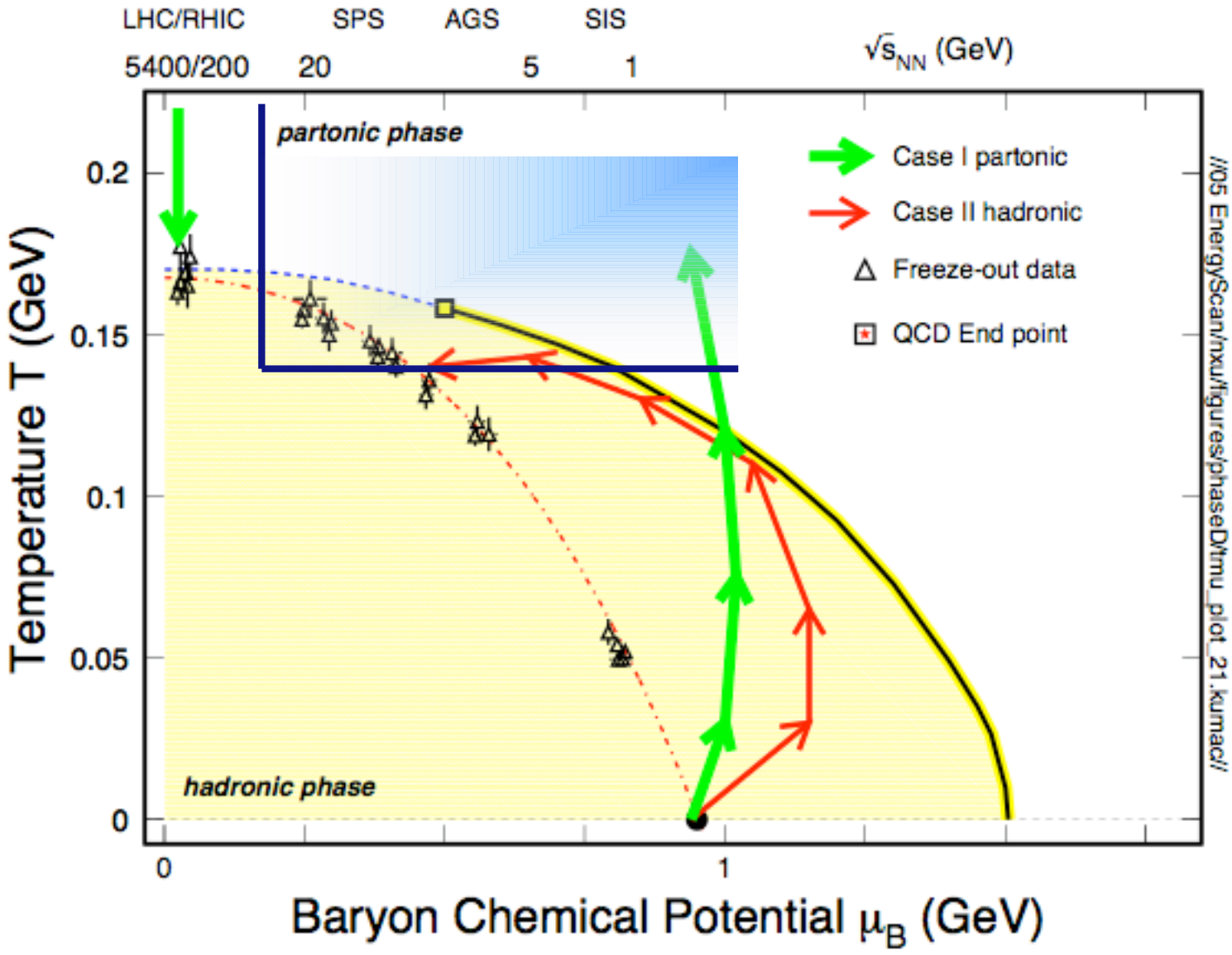
11:00 am - Claudia Ratti, SUNY, Stonybrook
Seminar on: **"Phases of QCD, Polyakov loop and quasiparticles"**

Thursday, July 31, 2008
9:30 am - Jens Braun, TRIUMF
Seminar on: "Chiral Phase Boundary from Quark-Gluon Dynamics"

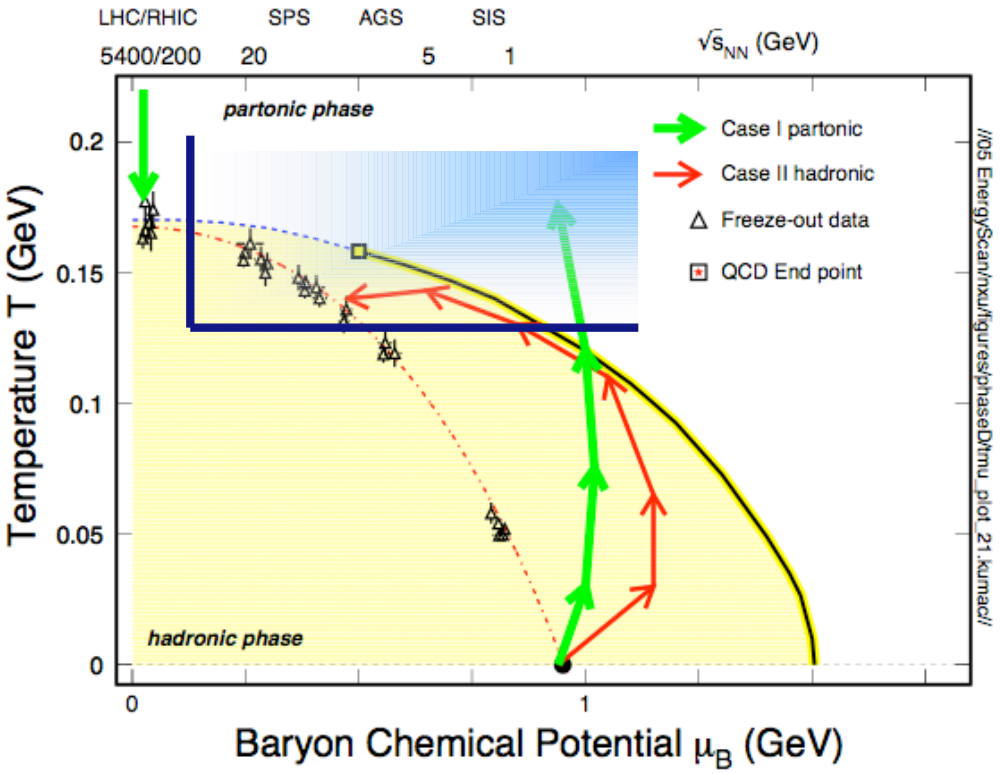
11:00 am - Bertram Klein, Technical University of Munich
Seminar on: "Scaling and finite-size scaling analysis of critical behavior in lattice QCD"

Friday, August 1, 2008
Discussions

QCD Phase Diagram



Lattice Results* Indicate:



Prediction the cross-over of T_C at zero chemical potential is most likely correct.

Most likely the region for the QCD critical point*:

$T \geq 140$ MeV

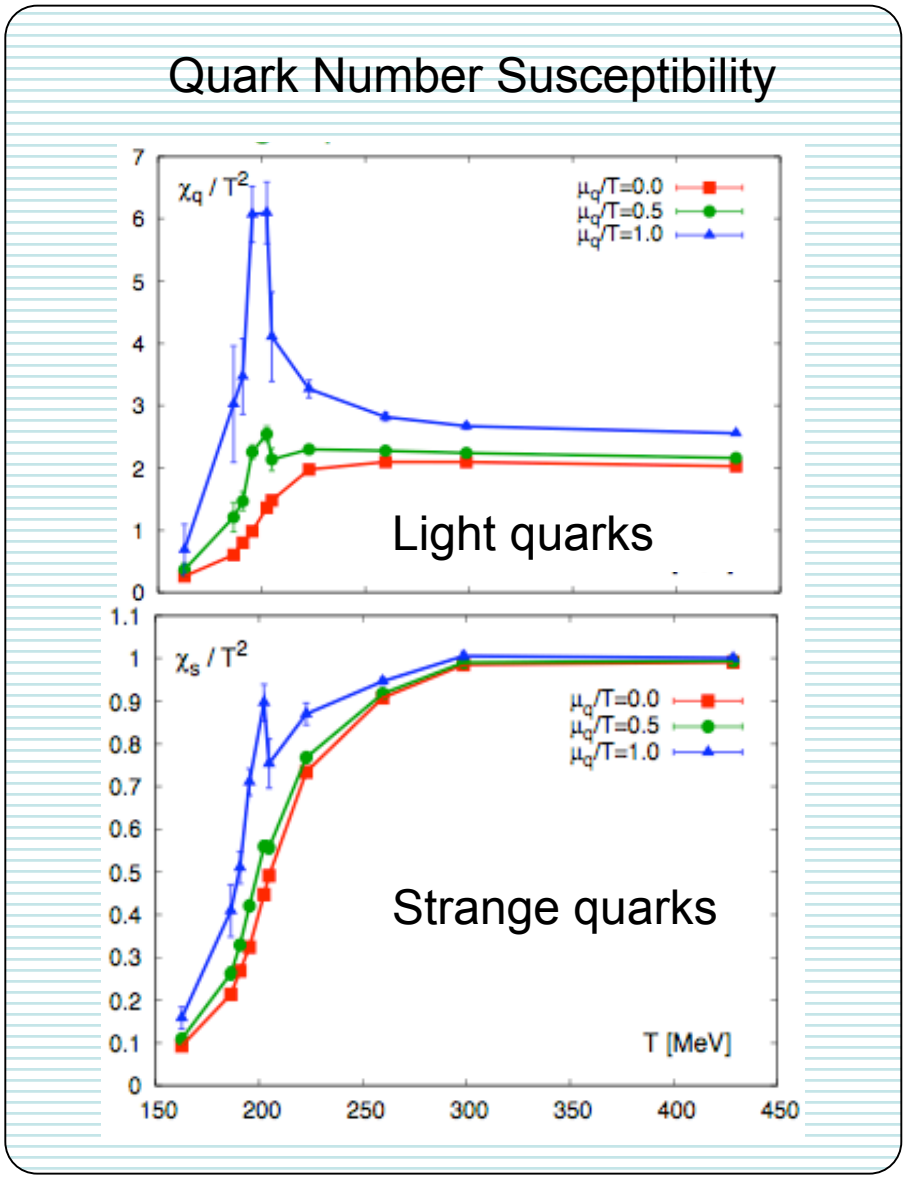
$\mu_B \geq 200$ MeV

$\Rightarrow$

$40 \geq \sqrt{s} \geq 5$ GeV

* In all Lattice calculations, global termalization are assumed.

Experimental Observables:



On Lattice: a spike in susceptibility means long range correlation at the critical point.

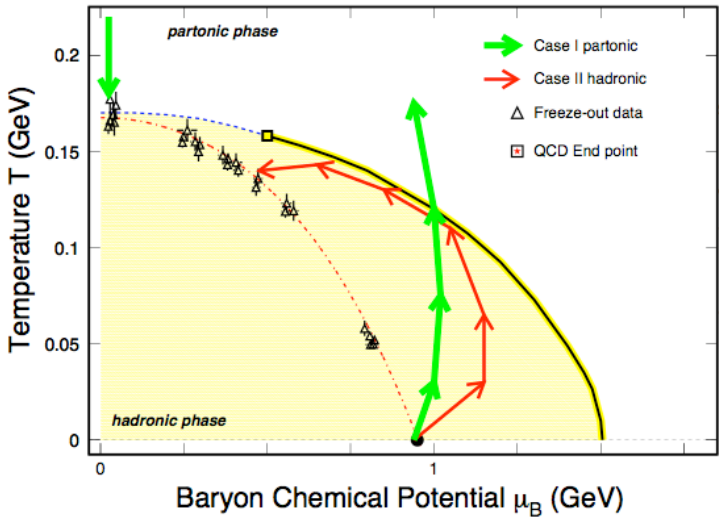
The equilibration of the medium is assumed in all Lattice calculations.

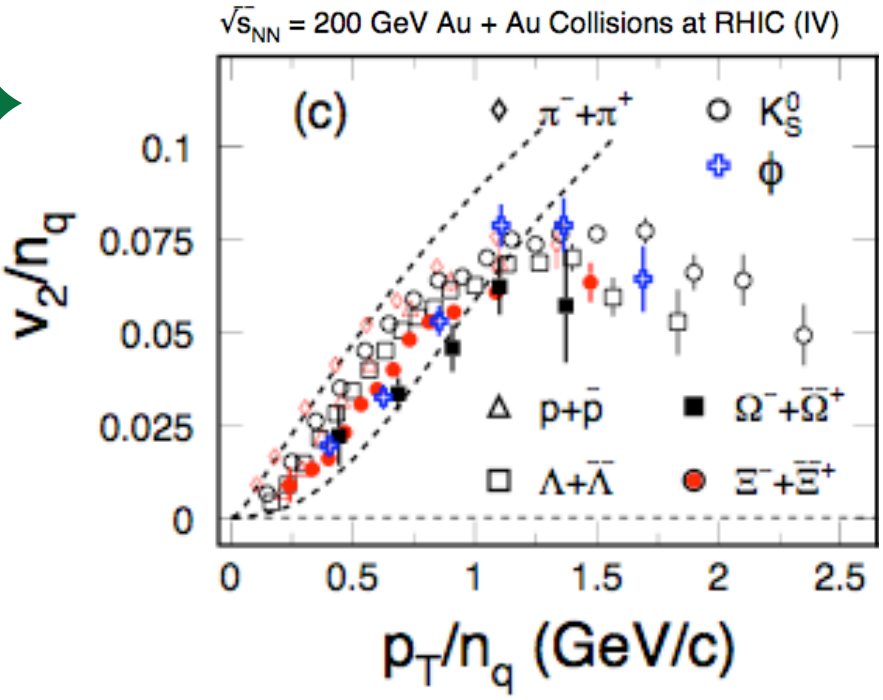
In Experiment: measure the correlation function of baryons or protons.

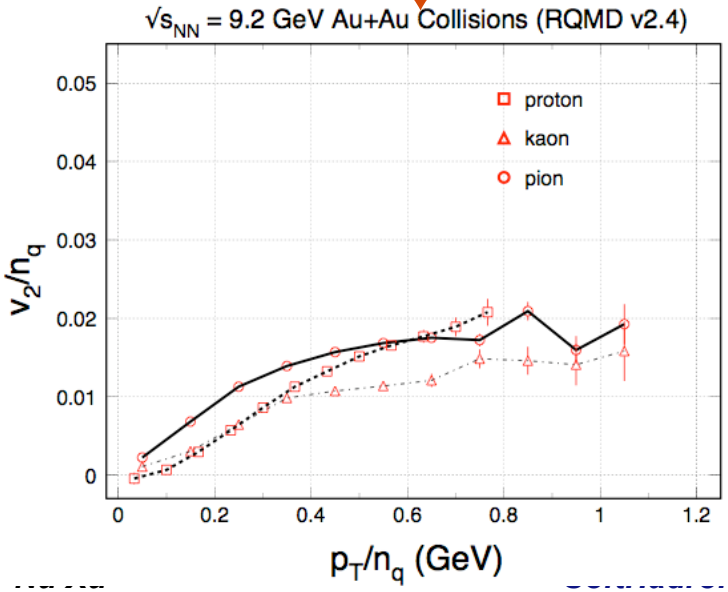
$$K_B = \frac{\langle N^4 \rangle - 3\langle N^2 \rangle^2}{\langle N^2 \rangle}$$

Kurtosis analysis for protons

Partonic vs. Hadronic Phases







- $m_\phi \sim m_p \sim 1$ GeV
- ss ⇨ ϕ not K^+K^- ⇨ ϕ
- $\sigma_{\phi h} << \sigma_{p\pi,\ \pi\pi}$

In the hadronic case, no number of quark scaling and the v_2 of ϕ will be small.

Summary

1) Lattice results indicating critical region:
   $T \geq 140$ MeV **$\mu_B \geq 200$ MeV**

2) Large fluctuation is expected in baryons

3) Kurtosis analysis for protons

4) v_2 of ϕ will help to identify partonic vs. hadronic regions.